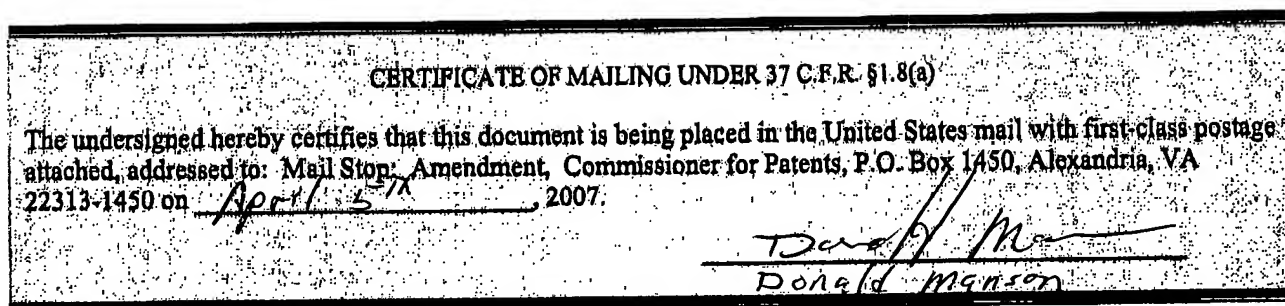




**PATENT**  
**EMC-97-153CON1**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

<b>APPLICANT:</b>	Douglas LeCrone, et al	<b>GROUP ART UNIT:</b>	2114
<b>U.S.S.N.:</b>	10/642,912	<b>CONFIRMATION NO.:</b>	3185
<b>FILING DATE:</b>	August 18, 2003	<b>EXAMINER:</b>	Chu, Gabriel L.
		<b>CUSTOMER NO.</b>	<b>24227</b>
<b>TITLE:</b>	<b>HOST SYSTEM FOR MASS STORAGE BUSINESS CONTINUANCE VOLUMES</b>		



Mail Stop: Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION UNDER 37 CFR 1.131**

Sir:

Douglas E. LeCrone and Bruce A. Pocock declare:

1. That they are the co-inventors who on March 13, 1998 filed the above-reference

U.S. Patent Application No. 10/642,912 entitled "Host System for Mass Storage Business Continuance Volumes" (the "Application").

**Applicant:** Douglas LeCrone, *et al.*  
**U.S.S.N.:** 10/642,912  
**Filing Date:** August 18, 2003  
**EMC Docket No.:** EMC-97-153CON1

2. That they conceived their invention in this country long prior to June 13, 1997, the filing date of U.S. Patent No. 6,216,211 entitled "Method and Apparatus for Accessing Logical Volumes" (the "McBrearty patent").

3. That at least as early as May 20, 1996, they began developing source code implementing the invention, as evidenced by the development history maintained in EMC Corporation's Interactive System Productivity Facility ("ISPF") directory listing, a screenshot of which is attached as Exhibit A. ISPF is a software library management tool for versioning, auditing, and promoting source code. It is maintained by EMC as an ordinary business record to provide developers with an interface to create software applications.

4. That at least as early as April 29, 1996, Douglas E. LeCrone produced the first working version of the source code implementing the invention.

5. That by August 8, 1996, Douglas E. LeCrone had a working version of the invention under software test as evidenced by EMC email records. A copy of this email is attached as Exhibit B.

6. That on December 12, 1996, Douglas E. LeCrone demonstrated all features of the invention to other EMC employees and senior members of an external SW development company under non-disclosure agreement with EMC. This demonstration is evidenced by EMC email records. A copy of this email is attached as Exhibit C

**Applicant:** Douglas LeCrone, *et al.*  
**U.S.S.N.:** 10/642,912  
**Filing Date:** August 18, 2003  
**EMC Docket No.:** EMC-97-153CON1

7. That the features of this invention were reduced to practice as documented in chapter three of an EMC product guide entitled "SYMMETRIX Multiple Mirror Facility MVS Batch Utility" which was first printed in February 1997. This document being printed to support shipment of this product later in 1997. A copy of this document is attached as Exhibit D.

8. That Douglas E. LeCrone worked substantially continuously on the development of this source code, in original and subsequent versions, from May 20, 1996 through the filing date of the Application on March 13, 1998, spending at least 20 manhours per week.

9. That Bruce A. Pocock worked substantially continuously on the development of this source code from his start date at EMC in August, 1997 through the filing date of the Application on March 13, 1998, spending at least 20 manhours per week.

10. That they do not know and do not believe that their invention has been in public use more than one year before the date of their application; and that they have never abandoned the invention.

11. That all statements made herein of their own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States

Applicant: Douglas LeCrone, *et al.*  
U.S.S.N.: 10/642,912  
Filing Date: August 18, 2003  
EMC Docket No.: EMC-97-153CON1

Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.


Respectfully submitted,

\_\_\_\_\_  
Date

April 5, 2007

Date

\_\_\_\_\_  
Douglas E. LeCrone

  
Bruce A. Pocock

# EXHIBIT A

## Screenshot of Development History Maintained in EMC Corporation's ISPF Directory Listing

```

*****
*
* MOD : SMMF
* DESC : CODE TO DEBUG SYMMETRIX MULTI MIRROR FACILITY
*
* PARS: H: TOTAL LEN OF PARS
*       C: 1 TO 4 CHAR CUU OF PRIMARY DEVICE
*       OR 6 CHAR VOLSER OF PRIMARY DEVICE
*       C: ,
*       C: 1 TO 4 CHAR CUU OF SECONDARY(BACKUP) DEVICE
*       OR 6 CHAR VOLSER OF SECONDARY(BACKUP) DEVICE
*       C: ,
*       C: 1 CHAR ACTION CODE (Q/S/E/R/N/X/V)
*       C: ,
*       C: 1 CHAR WAIT OPTION (Y/N)
*       C: ,
*       C: 1 CHAR MESSAGE OPTION (Y/N)
*       C: ,
*       C: 1 CHAR FORCE OPTION (Y/N)
*       C: ,
*       C: 2 CHAR HEX VALUE FOR THE SPLIT FLAG
*
* REGS : R15-R14 WORK
*       R10 BASE EMCIOB
*
*       C: 2 CHAR HEX VALUE FOR THE SPLIT FLAG
*
* REGS : R15-R14 WORK
*       R10 BASE EMCIOB
*
*****
* HISTORY:
*  DATE WHO CHANGE DESCRIPTION
* 04/15/96 DEL BASE CODE
* 05/02/96 DEL ADD THE X (RESTORE) OPTION
* 05/22/96 DEL ADD THE V (VERIFY) OPTION
* 06/07/96 DEL WHEN WAITING FOR THE ITRKS, EVERY 10 PASSES CALL THE
*              VERIFY ROUTINE
* 08/07/96 DEL CHANGE NAMES AROUND
* 09/03/96 DEL CHANGES TO THE QUERY OUTPUT, AND RESTORE OPTION Y
* 09/19/96 DEL USE DOIO
* 10/17/96 DEL ON A RESTORE IF I GET A REJECT CODE OF X'18' THEN
*              THERE ARE WRITE PENDINGS ON THE TARGET DEVICE SO
*              RETRY IN 5 SECONDS
* 10/19/96 DEL ADD ROUTCDE=11 TO SOME OF THE WTO'S
* 10/30/96 DEL ADD MSGCNSL OPTION
* 11/19/96 DEL CHANGE DOIO TO DOIOF AND NOT ALLOW ERP, I WILL DO
*              RE-TRYS MYSELF. ERP WAS PUTTING A 03 AFTER THE 27/3E
*              WHICH WAS CAUSING 0333 (EQU CHECKS) ON THE BCV
*              WHILE IT WAS ESTABLISHED.
* 02/27/97 PTN CHANGED CODE TO ACCEPT VOLSER NUMBERS FROM JCL
*              PARM INSTEAD OF REG CUU AND BCV CUU.
*              JCL PARM='&V2,&V,....'. V2 IS FOR REGUALR;
*              V, BCV.

```

```

* 03/07/97 PTN CHANGED CODE TO ACCEPT EITHER CUU OR VOLSER *
* NUMBER FROM JCL PARM. IF THE LEN OF V2 (REG) *
* PARAMETER IS LESS THAN 6 THEN PROCESS AS CUU; *
* LIKEWISE FOR &V (BCV). *
* 03/12/97 DEL FIX PTN CHANGES, ADD IODEV PARAMETER *
* 03/13/97 DEL ACCEPT RC OF 10H ON EST/RE-EST *
* 06/21/97 DEL RETRY SPLIT ON RC11 *
* 12/24/97 DAM ADD DISPLAY OF RC ON FAILURE *
* 01/08/98 DEL WAIT 1 SECOND AT END TO STOP MC PROBLEM OF COMING *
* TO QUICK AFTER ACTIONS IN THE SMMF* TESTS *
* 01/16/98 DEL ADD DIFFERENTIAL SPLIT OPTION (T) *
* 03/05/98 DAM ADD DUMP OPTION TO ABEND 999 *
* SAVE R0 ON RETURN FROM DOIOF - SAVED IOBRC *
* LOAD IT INTO R3 BEFORE ABEND *
* 03/18/98 DAM ADD AMODE 31 - CRASHED W/ 31-BIT UCBS *
* 06/05/98 DEL ADD SECOND DISPLAY FLAG *
* 06/19/98 DAM DISPLAY OUTPUT + DEV DATA IF BCV IN USE *
* 09/02/98 DAM CHECK FOR 1735 AND SET RC=4 *
* 10/21/98 DAM MADE DATA3E BUFFER BIGGER FOR FIND_BKUPDEV_ENTRY *
* ADJUSTED CP FOR LARGER BUFFER *
* 10/27/98 DEL CHECK FOR FILE-SMMF/HELD BCV IF TRUE ABEND *
* 10/28/98 DAM CHECK SYMM SER# ON BCV QUERY *
* 03/19/99 DEL CHANGE DOIOF TO DOIO *
* 04/05/99 DEL ON SPLIT CHECK IF FILE LEVEL SESSION FLAG IS ON *
* 04/06/99 DAM RESETTRC IF FILE LEVEL SESSION FLAG IS ON *
* 05/17/99 DEL RESETTRC DO NOT CHECK IF THE #STCPARM RSTTRC WAS DONE*
* 05/24/99 DAM FILE LEVEL FLAG *
* CALL RESETCHP ON SPLIT, RE-EST, RESTORE *
* 05/26/99 DEL DO NOT CHECK #STCPARM *
* 06/02/99 DAM FINAL TIME - REMOVE CALL TO RESETCHP *
* CREATED SMMFMAUI VERSION THAT CALLS RESETCHP *
* 06/18/99 DEL IF FILE LEVEL BIT ON MUST EXIT WITH RC8 *
* 01/19/00 DAM RETRY ESTABLISH AND RESTORE ON X'31' ERRORS *
* OPTIMIZER CLASH "UPGRADE IN PROGRESS" *
* 03/27/00 EDP RETRY UP TO 15 MINUTES FOR RC X'70' ON A RESTORE. *
* 07/06/00 DAM BAP-MACRO-IZE THIS SUCKER - SOMEBODY HAD TO DO IT *
* 07/06/00 DAM PUT IN CHECKS TO SEE IF OPTIMIZER HAS ATTACHED A DRV *
* DEV TO THE STD. RETURN RC=4 IF SO. *
*

```

```

.....

```

## EXHIBIT B

### Email Record of Invention Under Test by August 8, 1996 as Maintained in EMC Corporation's Email Records

This Message was received by VINES on Date: 08/07/1996@18:16:03 VINES  
MESID:CYh8+XKF0m

-----VINES Message Starts-----

Yes. Although our performance test schedule is not as stressed as it was a few months ago I need additional help with software testing. I have a new host software product (SMMF) and the SRDF-HC testing would benefit from Russel's RDF knowledge. So in general I would use Russel 50% for performance testing and 50% on software testing. This will also allow me to lighten Paul Ng's test responsibilities and allow him to do more coding.  
Thanks.

-----

Original Text

From: sarah zohn@eng@emchop1, on 8/7/96 6:14 PM:

Doug,

In about one month or so, we will be able to transfer Russel to work with you on Performance. Do you still have this need?

Sarah

## EXHIBIT C

### Email Record of Invention Demonstration on December 12, 1996 as Maintained in EMC Corporation's Email Records

This Message was received by VINES on Date: 12/11/1996@13:00:18 VINES  
MESID:CYh8+mOjfm

-----VINES Message Starts-----

IDP will be here at 9:30 am tomorrow (Thursday). I have scheduled  
conference center room A from 9:30 am until 2:00 pm.  
The agenda is as follows:

9:30 - 11:30	RDP presentation and discussion
11:30 - 12:30	lunch in conference room D (bag lunch for 10 people)
12:30 - 1:30	SMMF overview and MVS software component description (Yuval, Doug)
1:30 - 2:00	FDRSOS issues (Yuval, Martin, Doug)

Yuval, please invite the appropriate people for the RDP presentation.

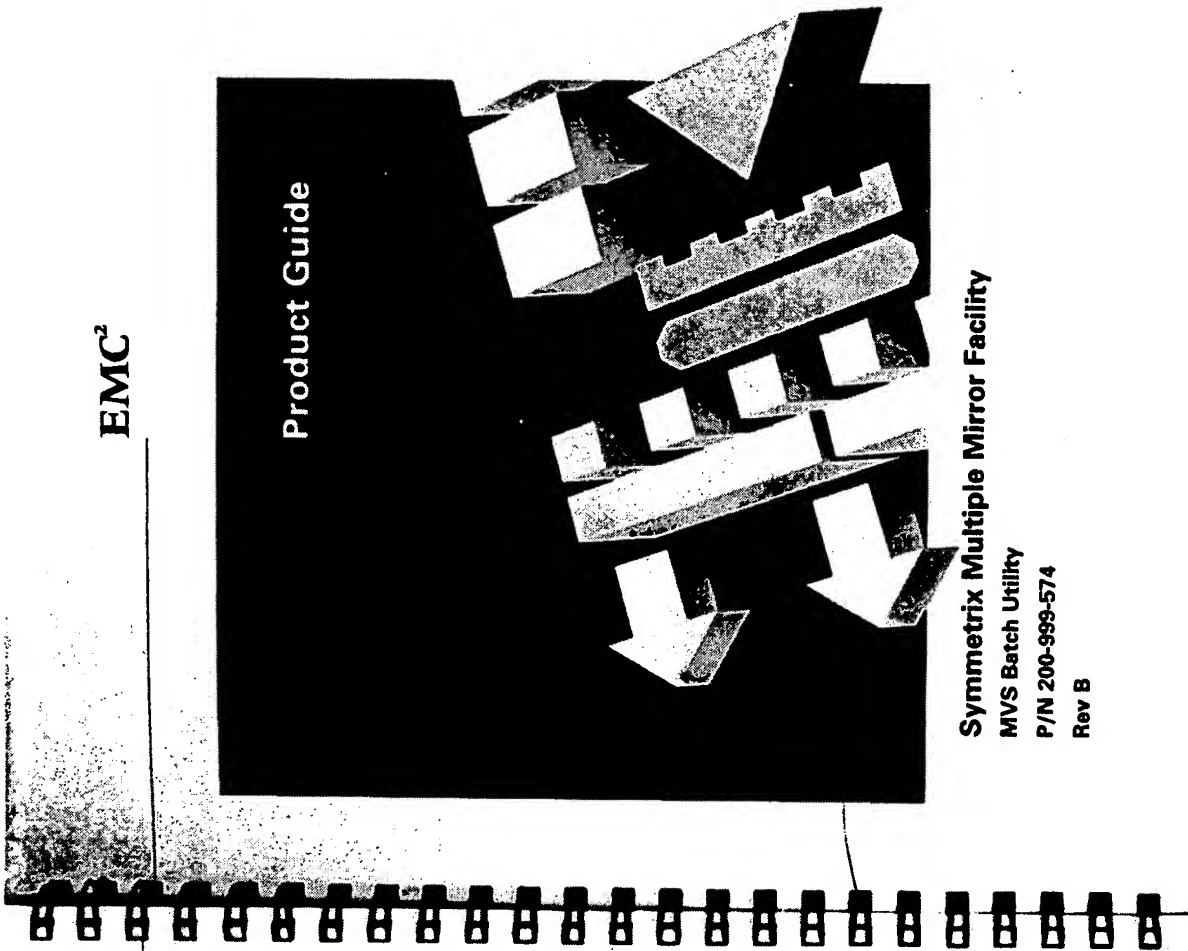
-----  
Original Text

From: doug lecrone@Eng@EMCHOP1, on 12/6/96 1:15 PM:  
IDP will be here next Thursday (12/12/96) at 9:30 am for a presentation of  
the RDP product. I gave them a 2 to 3 hour time estimate on a demo,  
presentation, and then a discussion on how they can implement the RDP  
feature in there products. I will be giving them a demo of the MVS host  
based SMMF product which should last about an hour. Also, while they are  
here if there are any FDRSOS issues on either side we can also discuss  
them. They are tentatively going to leave early in the afternoon although  
they have the flexibility to say later if needed. The following people  
from IDP will be attending: Anthony Mazzone, President & Chief Architect;  
Tom Meehan, VP Marketing & Operations; Bruce Black, Development Manager.

+ -

EXHIBIT D

EMC product guide entitled "SYMMETRIX Multiple Mirror Facility MVS Batch Utility"



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## Integrated Cached Disk Array

**SYMMETRIX**  
Multiple Mirror Facility  
MVS Batch Utility  
Release Version 1.0.0  
**Product Guide**  
P/N 200-999-574  
REV B

**EMC Corporation** 171 South Street, Hopkinton, MA 01748-9103  
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## Preface

*As part of its effort to continuously improve and enhance the performance and capabilities of the Symmetrix product line, EMC from time to time releases new revisions of Symmetrix hardware and microcode. Therefore, some functions described in this manual may not be supported by all revisions of the Symmetrix Multiple Mirror Facility (SMMF) MVS Batch Utility presently in use. If an SMMF MVS Batch Utility feature described in this guide does not function, please contact your EMC representative for assistance.*

This guide provides instructions for the operation of the SMMF MVS Batch Utility. Readers of this guide are expected to be familiar with the following topics:

- Symmetrix operation
- MVS operating system

Here is an overview of where information is located in this manual.

Chapter 1, "Product Overview," provides an overview of the SMMF MVS Batch Utility including its features and requirements.

Chapter 2, "Installation," provides the installation procedure.

Chapter 3, "SMMF Operations," contains an overview of the Symmetrix Multiple Mirror Facility (SMMF), a description of its key components, and a high level discussion of how to use these components in operations for business continuance.

Chapter 4, "SMMF with SRDF," explains how the SMMF operations in an SRDF configuration differ from those in a non-SRDF configuration.

Chapter 5, "SMMF Commands," describes the SMMF commands.

Appendix A, "SMMF MVS Batch Utility Messages," lists the messages that are reported by the SMMF MVS Batch Utility, the reason for the message, and the recommended user action.

Appendix B, "Technical Support," provides essential questions that a customer should be prepared to answer when contacting EMC's Customer Support.

Appendix C, "Examples," illustrates some uses of the SMMF MVS Batch Utility.

The Glossary describes terms used in this manual.

## Related Documentation

Other Symmetrix publications include:

- *Symmetrix Model 5700 Product Manual*, P/N 200-810-530, EMC Corporation
- *Symmetrix Model 5500 Product Manual*, P/N 200-810-550, EMC Corporation
- *Symmetrix Model 54xx Product Manual*, P/N 200-840-550, EMC Corporation
- *Symmetrix Model 5200 Product Manual*, P/N 200-811-554, EMC Corporation
- *Symmetrix Model 53xx Product Manual*, P/N 200-857-550, EMC Corporation
- *Symmetrix Model 5100 Product Manual*, P/N 200-855-550, EMC Corporation

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- *Symmetrix Remote Data Facility (SRDF) Product Guide*, P/N 200-999-554, EMC Corporation
- *Symmetrix SRDF Host Component Product Guide*, P/N 200-999-561, EMC Corporation

## Conventions Used in this Manual

Entries that you type are shown in monospace:

ESTABLISH seq#,cuus.cuup [,WAIT|NOWAIT]

EMC uses the following conventions for notes, cautions, and warnings.

A note calls attention to any item of information that may be of special importance to the reader.

▼ **CAUTION:** A caution contains information essential to avoid damage to the system or equipment. The caution may apply to hardware or software.

▼ **WARNING:** A warning contains information essential to the safety of personnel.

## Where to Get Help

EMC software products are supported directly by the EMC Customer Support Center, headquartered in the United States.

Obtain technical support by calling the EMC Customer Support Center at one of the following numbers:

U.S.: (800) 782-4362 (SVC-4EMC)

Canada: (800) 543-4782 (543-4SVC)

World Wide: 508-497-7901

Language services are available upon request.

Preface

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**Chapter 1** **PRODUCT OVERVIEW**

This chapter provides an introduction to the Symmetrix Multiple Mirror Facility (SMMF) MVS Batch Utility including its features, requirements, and options.

- Introduction..... 2
- Product Requirements..... 3
- Product Options..... 4

## 1.1 Introduction

The SMMF MVS Batch Utility is a business continuance solution that makes copies of data on standard Symmetrix devices available on special devices. These special devices are called Business Continuance Volumes (BCVs). The standard devices and special devices are online for regular I/O operations with attached host(s).

The business continuance (or SMMF) operations are run on Symmetrix devices pre-configured as Business Continuance Volumes (BCVs). The BCV devices are assigned separate host addresses, different from the host addresses used by the volumes they copy.

Uses for these copies of data can include:

- Backup operations
- Restore operations
- Decision Support operations
- Application testing

For more information on SMMF and the business continuance process, please refer to Chapter 3 in this manual.

PRODUCT OVERVIEW

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## 1.2 Product Requirements

This section provides the minimum system requirements for the SMMF MVS Batch Utility.

### Operating System Requirements

The SMMF MVS Batch Utility requires an MVS operating system environment.

When running MVS/ESA under VM, the SMMF Host Component requires volumes to be dedicated or unsupported device types.

### Symmetrix

To use the SMMF MVS Batch Utility, Symmetrix must be running microcode revision level 5063 or higher.

### Customer Environment

Please ensure that your Symmetrix unit has the following configuration:

- BCV volumes are configured in the Symmetrix unit.

Have your EMC Customer Engineer verify this condition before you perform any SMMF MVS Batch Utility commands.

Product Requirements

3

## 1.3 Product Options

EMC offers the following software options for Symmetrix. An EMC Customer Service Engineer configures Symmetrix for these options at installation or service time.

### Symmetrix Remote Data Facility (SRDF)

SRDF is a disaster recovery solution that maintains a mirror image of data at the logical volume level in two to five Symmetrix 5000 systems which can be located in physically separate sites.

SRDF offers two disaster recovery solutions:

- Campus Solution
- Extended Distance Solution

The Campus Solution allows Symmetrix units to be located up to 60 km (37.5 miles) apart using fiber-optic links. Symmetrix' unique architecture and synchronous data copying implementation combines to provide real-time mirroring on Symmetrix units with minimal affect on performance.

The Extended Distance Solution allows Symmetrix units to be located over 60 km apart using a T3 or E3 link. This solution uses a semi-synchronous mirroring technique to minimize performance degradation due to distance and telecommunications delays and to keep the data on the target volumes in a Symmetrix unit as current as possible to the data on the source volumes.

SRDF is transparent to the host operating system and host applications. It does not require additional host software for duplicating data on the Symmetrix units at the geographically-separate sites. The participating Symmetrix units manage all SRDF

PRODUCT OVERVIEW

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functions. SRDF, however, does require that a minimum of two of the available channel director slots in Symmetrix be used for its Remote Link Directors.

### Symmetrix Remote Data Facility (SRDF) Host Component

The SRDF Host Component is an MVS subsystem that monitors SRDF status and controls SRDF processing. The SRDF Host Component commands are executed at the host console.

The SRDF Host Component also has commands that control the BCVs when the SMMF option is configured in the Symmetrix unit. Refer to the *Symmetrix SRDF Host Component Product Guide* for information on these commands.

Product Options

5



## ***Chapter 2*** **INSTALLATION**



This chapter provides the installation procedure.

- Installation ..... 8

## 2.1 Installation

This section provides information necessary for the proper installation of the SMMF MVS Batch Utility.

### The Installation Tape

The SMMF MVS Batch Utility is distributed on a 3480 SL tape.

Customize the JCL in Figure 1 to unload the tape when installing the SMMF MVS Batch Utility in an MVS environment.

```
//jobcard
//UNLOAD
//F11
//
//F10
//
//F21
//
//F20
//
//SYSUT3
//SYSUT4
//SYSPRINT
//SYSIN
COPY INDD=F11,OUTDD=F10
COPY INDD=F21,OUTDD=F20
```

Figure 1. Customize to Unload the Tape

### Tape Label

The installation tape is standard-labeled and has a volser in the following format:

EMC*rrm* corresponds to:

*v* = version

*r* = revision level

INSTALLATION

*m* = modification level

For example, SMMF MVS Batch Utility version 1.0.0 has the volser, EMC100.

### Integrating the SMMF MVS Batch Utility

To integrate the SMMF MVS Batch Utility into your MVS environment, perform the following action:

- Move the load modules in File 1 to an APF-authorized library.

### Using the SMMF MVS Batch Utility

The interface to the SMMF MVS Batch Utility is through the program EMCSCMMF which may be executed from a batch job or a started task. The examples in Appendix C of this manual illustrate this usage.

All SMMF commands except QUERY must run on a BCV device. The SMMF commands allow you to control the state and relationship of the BCV devices.

The SMMF MVS Batch Utility accepts parameters through the SYSIN ddname. You may specify up to 512 actions and up to 128 different sequence levels. During operations that change the state of a device, the host issues an ENQ for the device to serialize requests. It uses the resource QNAME of EMCSCMMF and the RNAME is *serial-number.drv*.

# Chapter 3 SMMF OPERATIONS

3

This chapter contains an overview of the Symmetrix Multiple Mirror Facility (SMMF), a description of its key components, and a high level discussion of how to use these components in operations for business continuance.

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### 3.1 Overview

The Symmetrix Multiple Mirror Facility (SMMF) is a business continuance solution which allows customers to use special devices that contain a copy of Symmetrix devices from an attached host(s) while the standard Symmetrix devices are on-line for regular I/O operation from their host(s). Uses for these copies can include backup, restore, Decision Support, and applications testing.

#### Business Continuance

SMMF Business Continuance (BC) is possible due to Business Continuance Volume (BCV) devices. These BCV devices are Symmetrix devices that are specially configured in Symmetrix to handle the use of these copies. Each BCV device has its own host address, and is configured as a stand-alone Symmetrix device.

A business continuance sequence first involves setting, or establishing, the BCV device as a mirror of a standard Symmetrix device, making the BCV device inaccessible through its original device address. The BCV device may later be separated, or split, from the standard Symmetrix device with which it was previously paired. The BCV device now has valid data, and is available for backup or other host processes through its original device address. Once host processes on the BCV device are complete, the BCV may again be mirrored to a standard Symmetrix device (either the same device to which it was previously attached or a different device) for the purposes of acquiring new data for other BC processes or updating the standard device with the data from the completed BC processes.

### System Setup

One or several hosts can be attached to a Symmetrix unit containing the BCV devices (see Figure 2). Any Symmetrix system, including those configured for protection modes such as RAID (1 or 5), sparing, and SRDF, supports the SMMF option.

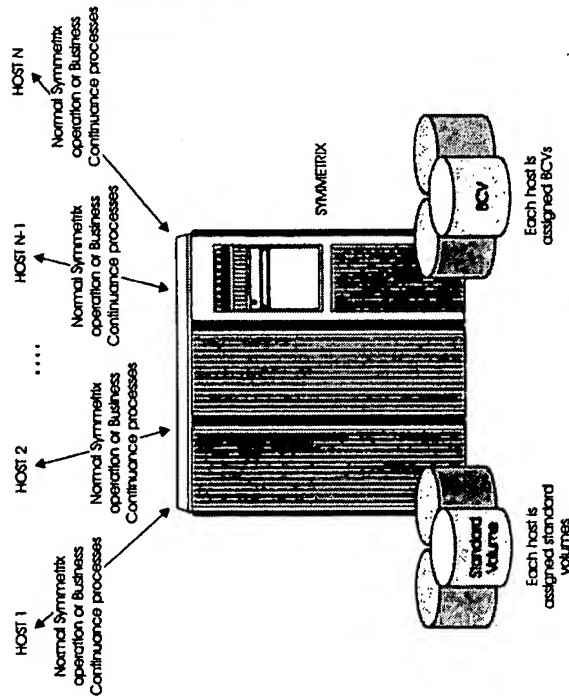


Figure 2. A Simple SMMF System

## 3.2 Components

The main components of SMMF are:

- Standard devices
- BCV devices

BCV devices and standard devices both reside in the same cabinet (see Figure 3).

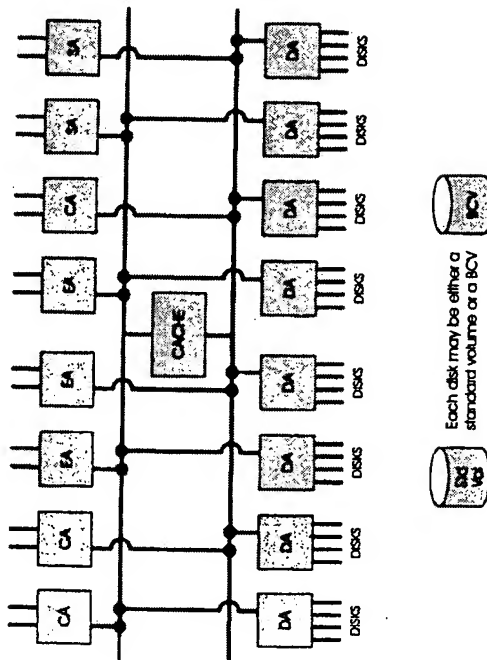


Figure 3. Symmetrix Devices

## Standard Devices

These are the standard Symmetrix devices which are configured for normal Symmetrix operation under a desired protection method (such as RAID-1, RAID-5, SRDF).

The standard device can have any mirror structure (normal, RAID, RAID with SRDF), as long as the number of mirrors does not exceed three. This constraint is in place because establishing a BCV pair requires assigning the BCV device as the next available mirror of the standard device.

## BCV Devices

A BCV device is a standard Symmetrix device with special attributes that allow it to independently support host applications and processes. A BCV device can have a spare while it is not mirrored to a standard device.

## Subcomponents

Once a BCV device is established as a mirror of a standard device, those two devices together are referred to as a BCV pair. The pair is comprised of two types of mirrors: the standard device mirror(s) and the BCV mirror.

## Standard Device Mirrors

The standard device mirrors are mirrors which each contain copies of the data contained in the standard device. There can be up to three standard device mirrors (M1, M2, M3).

## BCV Mirror

A BCV mirror is a standard device mirror (one of M2, M3, or M4) that is assigned upon creation of the BCV pair.

### 3.3 Operations

BC operations make use of the components described in the previous section in order to provide a foundation for various host business continuance processes.

SMMF offers the following BC operations which are available through host commands described later in this manual:

- Establishing a BCV pair

This command assigns the BCV as the next available mirror of a standard Symmetrix device and copies the entire contents of the standard device to the BCV.

- Splitting a BCV pair

This command splits the BCV from the standard Symmetrix device and makes it available to hosts through its separate device address.

- Re-establishing a BCV Device

This command reassigns the BCV as the next available mirror of the standard device to which it was assigned before it was split. The BCV is fully synchronized with the standard device.

Any data written to the BCV while it was split from the standard device is overwritten on the BCV. The BCV receives its updates from the standard device.

- Restoring from a BCV device

This command assigns the BCV as the next available mirror of a standard device and copies the entire contents of the BCV to the standard device. The standard device does not need to be the same device originally established with the BCV.

- Incrementally Restore from a BCV device

This command reassigns the BCV as the next available mirror of the standard device to which it was assigned before it was split. The standard device is fully synchronized with the BCV.

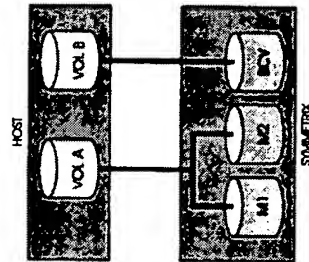
Any data written to the BCV while it was split from the standard device is overwritten on the standard device. Any updates made to the standard device while the BCV pair was split are discarded.

The following sections describe each of these operations.



## 3.4 Establish

After configuration and initialization of a Symmetrix unit, BCV devices contain no data. The BCV devices, like the standard devices, have unique host addresses and are online and ready to the host(s) to which they are attached. Figure 4 illustrates the initial Symmetrix configuration prior to performing any SMMF operations. In this figure the host views the Symmetrix M1/M2 mirrored pair as a single device (VOL A). The host views the BCV device as VOL B.

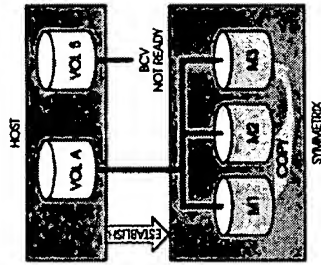


**Figure 4. Initial Configuration**

To obtain a copy of the data on a standard Symmetrix device, a BCV pair must be established. A BCV pair consists of a BCV device and a standard device. The standard device can have any mirror structure (normal, RAID, RAID with SRDF), as long as the number of mirrors does not exceed three. This constraint is in place because establishing a BCV pair requires assigning the BCV device as the next available mirror of the standard device. Since there is a maximum of four mirrors allowed per device in the

Symmetrix, a device already having four mirrors is not able to accommodate another one.

When Symmetrix receives an establish command from the host, it performs several functions. Figure 5 shows a BCV pair being established.



**Figure 5. Establishing a BCV Pair**

These functions include:

- Check command validity. For example, Symmetrix makes sure that both the standard device and the BCV device are the same size, the device specified as the BCV has the BCV attribute, the standard device does not already have a BCV device assigned to it, and so on.
- Set the BCV device not ready to the host.
- Assign the BCV device as the next available mirror of the standard device. A BCV may be the second, third, or fourth mirror of the standard device. For example, in Figure 5 it is the third mirror (M3).

Please note that if a BCV pair was being established with a standalone Symmetrix device, the BCV device becomes mirror two (M2).

- Copy the contents of the standard device to the BCV. For example, in Figure 5 the BCV device receives its data from both the M1 and M2 devices.

The BCV pair is synchronized when the standard device mirrors and the BCV mirror contain identical data.

The BCV device is not available for host use during the time that it is assigned as a BCV mirror on a standard device. However, any new data written to the standard device is copied to the BCV device while the BCV pair exists.

To use a BCV device for BC procedures, you must split the BCV pair to make the BCV device available to the host. If you wish to use a fully synchronized copy of the data, suspend all applications that are using the standard device, and make sure that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix prior to performing the split operation. If you do not require a coherent copy of the data for running a BC process, this step is unnecessary.

## 3.5 Split

After an establish operation and the standard device mirrors are synchronized (see Figure 5 on page 19), the BCV device contains a copy of the data from the standard device, valid until the point in time when a split command is issued. BC processes can now be executed with the BCV device.

When Symmetrix receives a split command from the host it performs several functions. Figure 6 below shows the result of the split operation.

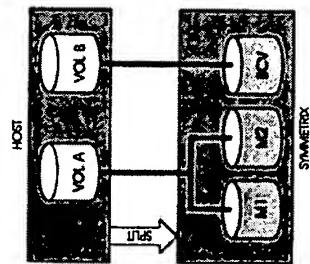


Figure 6. Splitting a BCV Pair

The functions performed by Symmetrix during the split operation include:

- Check command validity. For example, Symmetrix makes sure that the standard device has an active BCV mirror and that the standard and BCV devices comprise a BCV pair.
- Suspend I/O to the standard device until the split operation completes.

- Destage any write pendings to the standard device and the BCV device.
- Split the BCV device from the BCV pair.
- Change the BCV device state to ready, enabling host access through its separate address (VOL B).
- Resume operation with the standard device and flag any new writes to the standard device. (This is necessary for updating the BCV device if it is re-established with the same standard device at a later time.)

Once you finish running any BC processes on the BCV device, the following options are available:

- Re-establish the BCV pair  
You have the option to establish a new BCV pair (consisting of the same BCV device but with a different standard device).
- Restore data to the standard device from the BCV device
- Incrementally restore data to the standard device from the BCV device

These SMMF operations are described later in this chapter.

## 3.6 Re-establish

Re-establishing a BCV pair (Figure 7) accomplishes the same thing as the establish process, with one time-saving exception: the standard device (VOL A) copies to the BCV device only the new data that was updated on the standard device while the BCV pair was split. Any changed tracks on the BCV are also overwritten by the data on the corresponding track on the standard device. This process maximizes the efficiency of the synchronization.

The information necessary for a restore is lost (necessitating a full copy from the BCV mirror) if a spare is invoked against a standard device then removed while the standard device is split from the BCV device.

This process is useful if the data yielded from running an application on the BCV device is not needed or if a fresh copy of current data is needed.

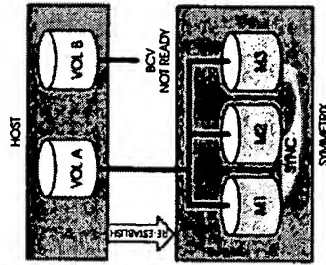


Figure 7. Re-establishing a BVC Pair

When Symmetrix receives a **re-establish** command from the host, it performs the following functions on the standard and BCV devices specified by the command:

- Check command validity. For example, reject the command if the BCV device and the standard device are not the same size.
- Set the BCV device not ready to the host.
- Assign the BCV device as the next available mirror of the standard device.
- Copy the tracks from the standard device to the BCV. Any new data written to the standard device while the BCV pair was split are written to the BCV device. Any new data written to the BCV device while the BCV pair was split are overwritten by the data on the corresponding track on the standard device.

The BCV pair is synchronized when the standard device and the BCV device contain identical data.

The BCV device is not available for host use during the time that it is assigned as a BCV mirror on a standard device. However, any new data written to the standard device is copied to the BCV device while the BCV pair exists.

To use a BCV device for BC procedures, you must again split the BCV pair to make the BCV device available to its host. If you wish to use a fully synchronized copy of the data, suspend all applications that are using the standard device, and make sure that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix prior to performing the split operation. If you do not require a coherent copy of the data for running a BC process, this step is unnecessary.

## SMMP OPERATIONS

## 3.7 Restore

The restore operation differs from the establish or re-establish operation in that the entire contents of the BCV device are copied to the standard device.

Symmetrix performs the following functions when it receives a **restore** command from the host:

- Check command validity. For example, reject the command if the BCV device and the standard device are not the same size.
- Set the BCV device not ready to the host.
- Assign the BCV as the next available mirror of the standard device.
- Copy the contents of the BCV device to the standard device. For example, in Figure 8 Symmetrix copies the contents of M3 to both M1 and M2, overwriting the data present on those devices.

The restoration process (Figure 8) is complete when the standard device and BCV device contain identical data.

## Restore

### 3.8 Incremental Restore

The incremental restore process (Figure 9) accomplishes the same thing as the restore process with one time-saving exception: the BCV (VOL B) copies to the standard device (VOL A) only the new data that was updated on the BCV device while the BCV pair was split. Any changed tracks on the standard device are also overwritten by the data on the corresponding track on the BCV device. This maximizes the efficiency of the synchronization process.

The information necessary for an incremental restore is lost (necessitating a full copy from the BCV mirror) if a spare is invoked against a standard device then removed while the standard device is split from the BCV device.

This process is useful if the results from running a new application on the BCV device were desirable, and the user wants to port the data and the new application to the standard device.

Incremental Restore

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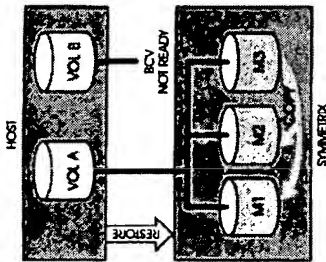


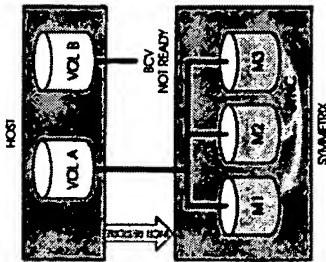
Figure 8. Restoring a BCV Device

The BCV device is not available for host use during the time that it is assigned as a BCV mirror on a standard device. However, any new data written to the standard device is copied to the BCV device while the BCV pair exists.

To use a BCV device for BC procedures, you must again split the BCV pair to make the BCV device available to its host. If you wish to use a fully synchronized copy of the data, suspend all applications that are using the standard device, and make sure that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix prior to performing the split operation. If you do not require a coherent copy of the data for running a BC process, this step is unnecessary.

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**Figure 9. Incrementally Restoring a BCV Device**

When Symmetrix receives an incremental restore command from the host, it performs the following functions on the standard and BCV devices specified by the command:

- Check command validity. For example, reject the command if the BCV device and the standard device are not the same size.
- Set the BCV device not ready to the host.
- Assign the BCV device as the next available mirror of the standard device.
- Copy the tracks from the BCV device to the standard device. Any new data written to the BCV device while the BCV pair was split are written to the standard device. Any new data written to the standard device while the BCV pair was split are overwritten by the data on the corresponding track on the BCV device.

The BCV pair is synchronized when the standard device and the BCV device contain identical data.

#### SMMF OPERATIONS

The BCV device is not available for host use during the time that it is assigned as a BCV mirror on a standard device. However, any new data written to the standard device is copied to the BCV device while the BCV pair exists.

To use a BCV device for BC procedures, you must again split the BCV pair to make the BCV device available to its host. If you wish to use a fully synchronized copy of the data, suspend all applications that are using the standard device, and make sure that all host buffering and intermediate caching is flushed to the appropriate logical device on the Symmetrix prior to performing the split operation. If you do not require a coherent copy of the data for running a BC process, this step is unnecessary.

#### Incremental Restore

## 3.9 Query

There is an additional SMMF command to assist you in performing business continuance operations. This command is:

- query

The query command reports the status of all BCV devices in the Symmetrix unit.

Symmetrix responds to a valid query command by returning device records for each BCV defined. The query command provides the following information:

- BCV device number
- standard device number (only valid for BCVs that have been established)
- number of tracks left to copy
- last four digits of Symmetrix unit serial number
- BCV availability states:
  - The BCV device is available for use, and was never established. Only the BCV device number is valid.
  - The BCV device is available for use, and was last established to the standard device whose number was returned and was fully synchronized.
  - The BCV device is available for use, and was last established to the standard device whose number was returned, but it was not fully synchronized.



- The BCV pair is established, the standard device number is valid, and the BCV mirror is fully synchronized.
- The BCV pair is established, the standard device number is valid, and the BCV mirror is being synchronized. Therefore, the invalid track count is accurate.
- A split is in progress, and the returned standard device number is valid.

## **Chapter 4 SMMF WITH SRDF**

This chapter explains how the SMMF operations on a Symmetrix Remote Data Facility (SRDF) system differ from those on a non-SRDF system.

- Using BCVs With Source (R1) Devices ..... 34
- Using BCVs With Target (R2) Devices ..... 36

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## 4.1 Using BCVs With Source (R1) Devices

If the Business Continuity Volumes (BCVs) are used in conjunction with source (R1) devices (see Figure 10 for a sample SRDF system), all Business Continuity (BC) processes operate in the manner described in Chapter 3, with the clarifications provided in the following sections.

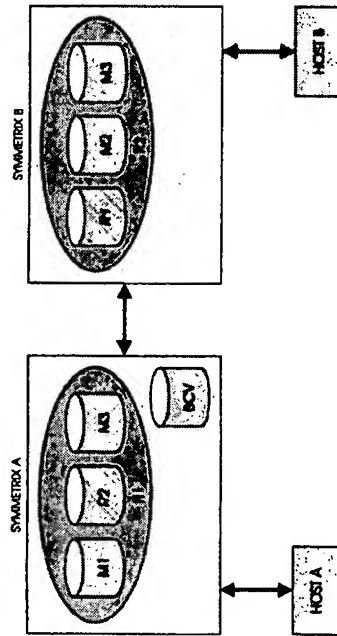


Figure 10. SRDF System

Mirror R2 on the Symmetrix unit attached to host A is a mirror representing the entire target (R2) device. Mirror R1 on the Symmetrix unit attached to host B is a mirror representing the entire source (R1) device.

### Establish/ Re-establish

In order to maximize the efficiency of the copy operation, Symmetrix copies the data locally from the standard device mirrors (M1 and M3 in Figure 10) unless problems or data unavailability necessitates obtaining the data from the target (R2) device in the Symmetrix unit attached to host B.

### Split

Executing a split on a BCV pair comprised of a standard source (R1) device and a BCV device does not affect data transfers with the target (R2) device.

### Restore/ Incremental Restore

If the SRDF source (R1) / target (R2) device pair is not suspended, the restore or incremental restore is made locally to the source (R1) device and remotely to the target (R2) device.

If the SRDF source (R1) / target (R2) device pair is suspended, the restore or incremental restore is only made locally to the source (R1) device and the invalid information is retained for later synchronization.

## 4.2 Using BCVs With Target (R2) Devices

If BCVs are used in conjunction with target (R2) devices, the BC processes may differ from that described in Chapter 3. The following sections discuss where the differences are found.

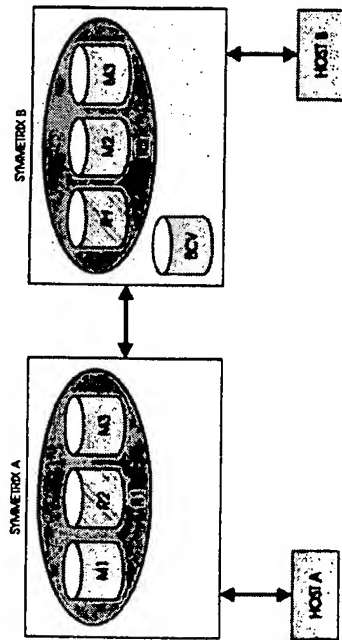


Figure 11. SRDF System

Mirror R2 on the Symmetrix unit attached to host A is a mirror representing the entire target (R2) device. Mirror R1 on the Symmetrix unit attached to host B is a mirror representing the entire source (R1) device.

### Establish/ Re-establish

The establish and re-establish processes are not changed if the BCV devices are used in conjunction with a target (R2) standard device. Refer to *Establish* on page 18 or *Re-establish* on page 23 for process details.

In order to maximize the efficiency of the copy operation on the Symmetrix attached to host B, Symmetrix copies the data locally from the standard device mirrors (M2 and M3 in Figure 11) unless problems or data unavailability necessitates obtaining the data from the source (R1) device in the Symmetrix unit attached to host A.

### Split

To execute the split process on the Symmetrix unit attached to host B, the following steps are performed (refer to Figure 11 for system topology):

1. The Symmetrix unit containing the target (R2) device associated with the BCV pair locks the device from further updates.
2. In order to execute a split, a host-level device lock is also needed. Since SRDF does not support this type of locking mechanism, if the SRDF source (R1)/target (R2) device pair is not already suspended, the remotely mirrored pair must be suspended for a few seconds to execute the split.
3. The Symmetrix unit containing the target (R2) device associated with the BCV pair executes the split command.
4. If the remotely mirrored pair was not previously suspended, the link is resumed. Any invalids from the source (R1) device (due to updates while the pair was suspended) are propagated to the target (R2) device for synchronization purposes.

A BCV device containing a copy of the target (R2) standard device data is now available for use by its host.

## Restore/ Incremental Restore

In order to perform a local restore or incremental restore to a target (R2) standard device (refer to Figure 11 for system topology), the following steps are performed:

1. The SRDF source (R1)/target (R2) device pair is suspended.
2. Data is restored locally on the standard target (R2) device.
3. All new data written to the target (R2) device are marked in case the changes are rolled over to the source (R1) device.

If the data is to be restored or incrementally restored locally *and* remotely, the following steps are performed after steps 1-3 above:

4. The standard source (R1) device is made unavailable to the host for the short period of time necessary to process the remote restore or incremental restore.
5. The new data that was written to the target (R2) device is transferred to the source (R1) device.
6. Normal SRDF operations resume with the remotely mirrored pair.

## Chapter 5 SMMF COMMANDS

This chapter provides a description of the SMMF MVS Batch Utility commands.

The commands listed in this chapter follow these conventions:

- CAPITALIZATION = must be typed
- [ ] = optional entry
- *Italics* = parameter
- | = alternative parameter value

## 5.1 Command Syntax

The actions to be performed are defined in the SYSIN DDname file. A (\*) in column one denotes a comment line. The supported command structures are defined below. The following conventions are used:

- *cuu* specifies any device on the controller.
- *cuup* specifies a standard device.
- *cuus* specifies a BCV.
- *seq#* specifies a decimal number 1 to 128 that indicates in what order the specified command is executed, all actions on the same sequence level will be executed in parallel
- *WAIT/NOWAIT* specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. Specifying *WAIT* will wait for the completion of the specified action, depending on the function and the load on the controller this may take a period of time. If *NOWAIT* is specified then the request is sent to the controller and the command is complete. When using *NOWAIT* you can issue the *QUERY* command to track the progress of the action.

All commands with the same *seq#* will be executed in parallel. After a *seq#* level is complete and all outstanding wait specifications are satisfied the next higher *seq#* level will be performed.

Table 1 below shows the valid commands and their relationship with the other parameters. The *cuup* parameter specifies the device number of the standard device. The *cuus* parameter specifies the device number of the BCV device. The *WAIT*

### SMMF COMMANDS

parameter specifies whether to wait for the action to complete.

Table 1. Valid Command Relationships

Action	cuup	cuus	WAIT
QUERY <sup>a</sup>	n/a	n/a	n/a
ESTABLISH	required	required	y/n
RE-ESTABLISH	n/a	required	y/n
SPLIT	n/a	required	y/n
RESTORE	optional	required	y/n

a. This command can be run against any device (standard or BCV) on the controller.

Please be aware that the operations you perform on the BCVs may alter the change bits and/or last reference date in the VTOC. This information will not be reflected back to the standard device unless you execute a *RESTORE* command.

Take special care when performing BCV operations on a Symmetrix unit attached to multiple hosts. During certain operations the BCV device will be unavailable to the host(s). Although the SMMF MVS Batch Utility can ensure that the BCV device is offline to the host that is performing the operation, you must also make sure that the BCV device is offline to other host(s) to which it is attached.

This manual intervention restriction will be corrected in a future release of this product.

### Command Syntax

## 5.2 GLOBAL

The GLOBAL command will set default values for all commands.

### Format

GLOBAL [WAIT | NOWAIT] [, MAXRC=0 | nn] [, NOCUU] [, DEBUG]

### Parameters

WAIT/NOWAIT

Specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. *WAIT* = wait for the completion of the specified action; *NOWAIT* = passes the command to the controller and assumes the action is complete. *The default value is WAIT.*

MAXRC

Sets the maximum return code accepted for the continuation of processing (see Appendix A for return codes). *The default value is 0.*

NOCUU

Disables a standard and BCU device search when the QUERY command is executed.

DEBUG

Only specify under the direction of EMC technical support

### Comments

Only one global command is allowed. If *WAIT/NOWAIT* is specified at the command level it will override the global setting. Specifying *WAIT* at the global or command level indicates that the action must complete before the command is considered done. If there are multiple commands at a *seq#* level

all wait conditions must be satisfied before the next level can be executed.

*MAXRC* sets the maximum return code accepted for continuation of processing. Informational message set a zero return code, Warning messages set a return code of four, and Error messages set a return code of eight.

The *nocuu* parameter will disable the CUU-BCV search when specifying the QUERY action.

The *debug* parameter should only be used at the direction of EMC technical support.

### Example

GLOBAL WAIT, MAXRC=4

## 5.3 QUERY

The QUERY command will display all the BCVs on the specified controller and their current status.

### Format

QUERY seq#, cuu [, ALL | count]

### Parameters

seq#	Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.
cuu	Specifies the MVS device number on the controller on which you wish to obtain information.
count	Specifies the number of BCV devices on which you wish to obtain information. If a count value is not specified, this command displays information on all BCV devices.

### Comments

The cuu specifies any device on the controller of interest. The MVS cuu for the BCV is displayed if the cuu to Symmetrix address relationship can be determined and nocuu is not specified on the GLOBAL statement. count allows you to limit the number of BCVs displayed by this action.

### Example

QUERY 1,100

## 5.4 ESTABLISH

The ESTABLISH command will copy the entire standard device to the BCV. The BCV will become not ready to the host.

### Format

ESTABLISH seq#, cuus, cuup [, WAIT | NOWAIT]

### Parameters

seq#	Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.
cuus	Specifies a BCV device.
cuup	Specifies a standard device.
WAIT/NOWAIT	Specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. WAIT = wait for the completion of the specified action; NOWAIT = passes the command to the controller and assumes the action is complete.

### Comments

The devices specified must have the same geometry and the BCV must be off-line to MVS. If the BCV was previously split, all tracking of the changed data for the previous standard/BCV pair will be discarded. You must specify both the cuup and cuus parameters. The WAIT parameter is optional and if specified, will override the GLOBAL command setting.

## 5.5 RE-ESTABLISH

The RE-ESTABLISH command will synchronize a previously split standard/BCV pair. The BCV will become not ready to the host.

**Format** RE-ESTABLISH seq#,cuus [,WAIT | NOWAIT]

**Parameters** seq# Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.

cuus Specifies a BCV device.

WAIT/NOWAIT

Specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. WAIT = wait for the completion of the specified action; NOWAIT = passes the command to the controller and assumes the action is complete.

### Comments

The data flow is from the standard device to the BCV. The BCV must be off-line to MVS. Only the data change on the standard device will be copied to the BCV. If there was any changed data on the BCV device, this data will be lost.

The RE-ESTABLISH process may take a period of time to complete if there was a large amount of update activity to the standard device and/or BCV.

### Examples

RE-ESTABLISH 1,140,NOWAIT

RE-ESTABLISH



## 5.6 RESTORE

The RESTORE command will copy data from a BCV to a standard device. The BCV will become not ready to the host.

### Format

RESTORE seq#,cuus [,cuup] [,WAIT | NOWAIT] [,VERIFY(volser)]

### Parameters

seq# Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.

cuus Specifies a BCV device.

cuup Specifies a standard device.

WAIT/NOWAIT

Specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. WAIT = wait for the completion of the specified action; NOWAIT = passes the command to the controller and assumes the action is complete.

VERIFY(volser)

This is a required parameter for a full restore operation (cuup is specified). Ensures that the volser specified by this parameter is the same as the standard device specified by cuup.

### Comments

If cuup is not specified then the operation is a partial restore to the last standard device attached to the BCV and only the changed data on the standard device and BCV will be synchronized. If there was any changed data on the standard device this data will be lost.

If cuup is specified, then the entire contents of the BCV is copied to the specified standard device. The VERIFY parameter is required for a full restore operation..

The BCV must be offline to MVS for both full and partial restore operations. The standard device must be offline to MVS for a full restore operation. If you perform a partial restore with the standard device online, you may need to vary the device offline then online again depending on the data that was refreshed.

A WTOR is issued to the system console for operator confirmation for both full and partial restore operations.

The RESTORE process may take a period of time to complete if there was a large amount of update activity to the standard device and/or BCV.

The BCV must be offline to MVS for both partial and full RESTORE operations. The standard device must be offline to MVS for full restore operations.

### Example

RESTORE 1,200,300,WAIT

RESTORE

## 5.7 SPLIT

The SPLIT command will stop the mirroring process between the two devices. Once the standard to BCV relationship is split, the changed tracks for both devices will be logged and the BCV will become ready to the host.

### Format

SPLIT seq#, CUUS [, WAIT | NOWAIT] [, FORCE | NOFORCE] [, VALID(volser)]

### Parameters

seq# Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.

CUUS Specifies a BCV device.

WAIT/NOWAIT

Specifies the ability to wait for the completion of the action or to continue once the command is passed to the controller. WAIT = wait for the completion of the specified action; NOWAIT = passes the command to the controller and assumes the action is complete.

FORCE/NOFORCE

FORCE allows you to split the pair during an establish or restore operation (invalid tracks exist on the device). NOFORCE specifies that the pair may not be split until the establish or restore operation completes. The default value is NOFORCE.

VALID Changes the VOLSER of the BCV after the BCV pair splits. This option is only allowed when the WAIT option is specified by this command or is implied by the GLOBAL statement.

### Comments

Once the split occurs you may then resume the relationship between the two devices in which case only the modified tracks will be synchronized.

You may also change the standard device associated with this BCV in which case the entire device would be copied.

The FORCE option allows you to split the pair during an ESTABLISH or a RESTORE (invalid tracks on device) action.

### Example

SPLIT 1,140

## 5.8 USEREXIT

The USEREXIT statement allows you to pass control to a user written program during the processing of SMMF actions.

<b>Format</b>	USEREXIT seq#, load-module-name, p1, p2
<b>Parameters</b>	<p>seq# Specifies a decimal number from 1 to 128 that indicates in what order the specified command is executed. All actions on the same sequence level will be executed in parallel.</p> <p>load-module-name Specifies the user-written program to which control is to be passed during the processing of SMMF actions.</p> <p>p1 4 character hexadecimal value.</p> <p>p2 4 character hexadecimal value.</p>

### Comments

The program specified will be linked to using the LINK macro while passing the parameters p1 and p2 which are 4 character hexadecimal values. The exits will be executed on their sequence level in the order they were specified in the SYSIN file. The exit routine must specify in R15 the exit return code when returning control. This return code will be checked against the MAXRC specified in the GLOBAL statement.

### Example

```
USEREXIT 1, WAITBKUP
```

## Appendix A SMMF MVS BATCH UTILITY MESSAGES

This appendix describes and lists the messages reported by the SMMF MVS Batch Utility, the reason for the message, and the recommended user action.

- Message Format..... 54
- Messages BCVI..... 55
- Messages BCVM..... 59
- User Abend Codes..... 69

## A.1 Message Format

Message Format:

BCVxyyyz

where:

x = message ID

yyy = a message number

z = a message class:

I (Informational, rc=0)

R (Reply)

W (Warning, rc=4)

E (Error, rc=8)

Representation:

cuv = MVS device number

cusp = device number of standard Symmetrix device

cuis = device number of BCV device

seq# = decimal number that indicates in what order to the specified command is executed

## A.2 Messages BCVI

BCVI000E

DDNAME SYSIN NOT FOUND

Cause: The SYSIN ddname is not present in your JCL.

Action: Specify the SYSIN ddname in your JCL.

BCVI001E

OPEN FAILED FOR DDNAME SYSIN

Cause: The SYSIN ddname is coded correctly.

Action: The record size must be 80.

BCVI002E

THE FOLLOWING INPUT STATEMENT IS INVALID

Cause: The input statement does not start with a valid keyword.

Action: Specify a correct keyword.

BCVI003E

NO ACTION FOUND ON INPUT LINE

Cause: No action was found on the input line.

Action: Specify the action to be performed before the end of the line.

BCVI004E

SYNTAX ERROR ON THE FOLLOWING STATEMENT

Cause: A syntax error was encountered on the input statement.

Action: Review the statement and correct the error.

- BCVI005E** CUU ON STATEMENT NOT FOUND  
Cause: The device specified was not found on your system.  
Action: Specify a device on the controller you wish to view.
- BCVI006E** CALL TO EMCSAI HAD A NON-ZERO RETURN CODE  
Cause: A call to the EMCSAI controller interface returned a non-zero return code. The probable cause is a device in a invalid state.  
Action: Verify the state of the device with the MVS 'DS Pcuu' command. If this command completes without error and shows on-line channel paths then report the problem to EMC technical support.
- BCVI007E** CUUS/CUUP not a EMC device  
Cause: The device specified is not on a EMC controller.  
Action: Specify a device on the EMC controller you want to view.
- BCVI008E** MICROCODE LEVEL NOT VALID  
Cause: The device specified is on a EMC controller with a microcode level lower than 5063.  
Action: The controller must be at microcode level 5063 or higher.

- BCVI009E** SEQUENCE NUMBER MUST BE FROM 1 TO 128  
Cause: The sequence number specified is outside the allowable range.  
Action: Specify a sequence number from 1 to 128.
- BCVI010E** ONLY ONE GLOBAL STATEMENT IS ALLOWED  
Cause: Two GLOBAL statements were specified.  
Action: Delete one of the GLOBAL statements.
- BCVI011W** NO ACTIONS FOUND BEFORE SYSIN EOF  
Cause: No actions were found in the SYSIN file.  
Action: Specify a action to be performed.
- BCVI012E** MORE THAN 512 ACTIONS SPECIFIED  
Cause: More the 512 actions were specified in the SYSIN file.  
Action: Reduce the number of actions to 512 or less.
- BCVI013W** WAIT MUST BE SPECIFIED ON SPLIT WITH VOLID  
Cause: The VOLID option was specified on the SPLIT but the WAIT option is not specified.  
Action: Specify the WAIT option in the GLOBAL or SPLIT statement.
- BCVI014E** INVALID SYNTAX ON VERIFY STATEMENT  
Cause: The VERIFY option is specified incorrectly on a RESTORE request.  
Action: Correct the syntax and re-submit the command.



BCV015E

VERIFY MUST BE SPECIFIED ON A FULL RESTORE

Cause: A full RESTORE is specified and the required option VERIFY is missing.

Action: Specify the VERIFY option in the RESTORE statement and re-submit.

## A.3 Messages BCVM

BCVM000E

CUUP/CIUS ARE NOT ON THE SAME CONTROLLER

Cause: The devices specified are not on the same controller.

Action: Specify devices that are on the same EMC controller. To get a listing of your BCVs use the QUERY action.

BCVM001E

DEVICE xxxx IS NOT A BCV

Cause: The device specified is not a BCV.

Action: Use the QUERY action to display your BCVs.

BCVM002E

I/O ERROR OCCURRED WHILE RETRIEVING  
DEVICE INFORMATION

Cause: An I/O occurred while retrieving information from the controller.

Action: The specified device may be off-line, but there must be a path to the device on-line. Use the MVS command Display Path to view the path status.

BCVM003I

specifies heading for the QUERY command

Cause: Specifies the heading for the QUERY action. The field descriptions are as follows:

CUU-BCV specifies the MVS cuu address if it is available.

DV#-BCV specifies the internal EMC device number of the BCV.

DV#-PRM specifies the internal EMC device number for the standard device.

ITRK-BCV specifies the number of tracks to be refreshed on the BCV device after an ESTABLISH or RE-ESTABLISH command has been issued.

ITRK-REG specifies the number of tracks to be refreshed on the standard device after a RESTORE has been issued.

STATUS specifies the status of the BCV, the following are valid:

AVAIL = BCV is available

AVAILB= BCV is available, last action did not complete (SPLIT with *force* used)

INUSE = BCV is attached to a standard device

INUSEX= BCV is attached and the copy process is in progress

TERM = the BCV is processing a SPLIT action

Action: None.

#### BCVM004I

specifies the action that is going to be executed

Cause: Specifies the action that is going to be executed.

Action: None.

#### BCVM005E

ESTABLISH REJECTED, BCV xxxx IS IN USE

Cause: The BCV specified is already in use.

Action: Use the QUERY action to display the available BCVs.

#### BCVM006E

ESTABLISH FAILED ON BCV xxxx, REASON CODE yy

Cause: The ESTABLISH action failed, see the return codes below.

Action: Correct the problem and re-issue the action. If the action specified is correct or the code is not listed please contact EMC technical support.

Codes:

01 standard device does not exist

02 standard specifies a BCV

03 standard already has a BCV mirror

04 standard has four active mirrors

05 BCV is not the device which initiated the command

06 BCV specified is not a BCV device

07 BCV is in use

08 BCV has more than one mirror

09 standard and BCV are not compatible

0A invalid request options

0B standard and BCV are not the same emulation type

0D standard is not ready

10 establish in progress

13 standard and BCV are the same device

14 controller type is invalid

15 concurrent copy session active

17 BCV is not ready

F0 controller completed the request although the BCV is not in use

#### BCVM007I

INVALID TRACKS ON xxxx IS yyyyyyyy

Cause: Specifies the number of invalid tracks during synchronization processing. This message will only appear when *debug* is specified.

Action: None.

**BCVM008E**

SPLIT REJECTED, BCV xxxx IS NOT IN USE

Cause: The BCV specified is not in use.

Action: Use the QUERY action to display your BCVs and their status.

**BCVM009E**

SPLIT FAILED ON BCV xxxx, REASON CODE yy

Cause: The SPLIT command failed, see the return codes below.

Action: Correct the problem and re-issue the action. If the action specified is correct or the code is not listed please contact EMC technical support.

Codes:

- 01 standard device does not exist
- 02 standard device is a BCV
- 03 no active mirror for the standard
- 05 BCV is not the device which initiated the command
- 06 BCV specified is not a BCV device
- 0A invalid request options
- 0D mirrors are not ready
- 10 split in progress
- 11 standard device is busy
- 14 controller type is invalid
- 15 concurrent copy session active on standard
- 21 valid BCV pair not specified
- 22 resource constraint
- F0 controller completed the request although the BCV still shows in use
- F1 the retry count has been exceeded for codes 22

*Handwritten notes:*  
- V1.01  
- V2.0  
- 1 min V2.0  
- 5 min P3  
- F1  
- 39.

**BCVM010E**

RE-ESTABLISH REJECTED, BCV xxxx IS IN USE

Cause: The BCV specified is already in use.

Action: Use the QUERY action to display your BCVs and their status.

**BCVM011E**

RE-ESTABLISH FAILED ON BCV xxxx, REASON CODE yy

Cause: The RE-ESTABLISH command failed, see the return codes below.

Action: Correct the problem and re-issue the action. If the action specified is correct or the code is not listed please contact EMC technical support.

Codes:

- 01 standard device does not exist
- 02 standard device is a BCV
- 03 standard has a active BCV
- 04 standard has four active mirrors
- 05 BCV is not the device which initiated the command
- 06 BCV specified is not a BCV device
- 07 BCV is in use
- 08 BCV has more than one mirror
- 09 standard and BCV are incompatible
- 0A invalid request options
- 0B standard and BCV are not the same emulation type
- 0D standard is not ready
- 0F BCV was not previously attached to the standard
- 13 standard and the BCV are the same device
- 14 controller type is invalid
- 15 concurrent copy session active on standard
- 17 BCV is not ready
- F0 controller completed the request although the BCV shows not in use

**BCVM012E**

RESTORE REJECTED, BCV xxxx IS IN USE

Cause: The BCV specified is already in use.

Action: Use the QUERY action to display your BCVs and their status.

### BCVM013E

RESTORE FAILED ON BCV xxxx, REASON CODE yy

Cause: The RESTORE command failed, see the return codes below.

Action: Correct the problem and re-issue the action. If the action specified is correct or the code is not listed please contact EMC technical support.

#### Codes:

- 01 standard device does not exist
- 02 standard device is a BCV
- 03 standard has a active BCV
- 04 standard has four active mirrors
- 05 BCV is not the device which initiated the command
- 06 BCV specified is not a BCV device
- 07 BCV is in use
- 08 BCV has more than one mirror
- 09 standard and BCV are incompatible
- 0A invalid request options
- 0B standard and BCV are not the same emulation type
- 0D standard is not ready
- 11 standard device is busy
- 13 standard and the BCV are the same device
- 14 controller type is invalid
- 15 concurrent copy session active on standard
- 17 BCV is not ready
- 18 standard device has write pendings
- F0 controller completed the request although the BCV shows not in use
- F1 retry count was exceeded for codes 11/18

### BCVM016E

USER EXIT xxxxxxxx NOT FOUND

Cause: The USEREXIT action specified a load module that could not be found.

Action: Specify a valid load module.

### BCVM017I

USER EXIT RETURN CODE xxxxxxxx

Cause: The return code from the USEREXIT routine.

Action: None.

### BCVM018E

WAIT TIME EXCEEDED, BCV xxxx

Cause: While waiting for the completion of a event the internal wait timer expired.

Action: Use the QUERY action to view the status of the BCV. If it is not in the desired state contact EMC Customer Support.

### BCVM019E

OPEN DCB'S ON DEVICE xxxx

Cause: On a full restore operation the standard device was online to MVS.

Action: Vary the standard device offline before retrying the restore.

### BCVM020E

BCV NEVER ESTABLISHED, CAN NOT BE RESTORED

Cause: On a restore request the BCV was found to have never been established.

Action: Chose a BCV that was previously established.

### BCVM021E

BCV x ENQ FAILED, IN USE BY ANOTHER JOB

Cause: The BCV specified is being processed by the EMCSMMF utility on this or another system.

Action: Wait until the BCV is available or use another BCV.

BCVM022E

NO BCV'S ON CONTROLLER

Cause: A QUERY action was issued against a controller with no defined BCV's.

Action: Define some BCV's and re-issue the action.

BCVM023W

BCV x HAD INVALID TRACKS ON A SPLIT

Cause: A Split action was issued against a BCV although the BCV has invalid tracks from a previous ESTABLISH/RE-ESTABLISH action. The action completed because FORCE was specified.

Action: Any track that was not copied because of the SPLIT will receive a data check until it is formatted.

BCVM025E

BCV x EXCEEDED WAIT TIME ON TERMINATE

Cause: During a SPLIT action the pair did not separate in the allotted time.

Action: Issue a QUERY command to see if the pair split, if not contact EMC customer service.

BCVM026E

BCV x MUST NOT BE ON-LINE FOR ACTION

Cause: An ESTABLISH or RE-ESTABLISH action has been requested although the BCV is on-line.

Action: The BCV must be off-line for the requested action.

BCVM027E

BCV x LAST ESTABLISH WAS INCOMPLETE

Cause: A RESTORE action was issued against a BCV although the last ESTABLISH to the BCV did not complete. RESTORE terminated.

Action: There must be a successful ESTABLISH to the BCV before the RESTORE action can be used.

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BCVM028E

BCV x HAD INVALID TRACKS ON A SPLIT

Cause: A SPLIT action was issued against a BCV although the BCV has invalid tracks from a previous ESTABLISH/RE-ESTABLISH action. The action is terminated.

Action: None.

BCVM029W

CLIP FAILED ON BCV xxxx

Cause: The process to change the VOLSER of the BCV failed.

Action: Contact EMC customer support.

BCVM030I

CLIP COMPLETED ON BCV xxxx

Cause: The VOLID option specified on the SPLIT has been completed.

Action: None.

BCVM031R

FULL RESTORE DEVICE xxxx, REPLY Y TO RESTORE OR N TO FAIL

Cause: A full RESTORE action has been requested.

Action: The operator must confirm the request.

BCVM032E

OPERATOR FAILED RESTORE OF DEVICE xxxx

Cause: The operator failed the full RESTORE request.

Action: Contact the operator.

Messages BCVM

BCVM033E

DEVICE xxxx FAILED VOLID VERIFICATION

Cause: A full RESTORE was requested but the supplied VOLSER on the VERIFY option does not specify the correct VOLSER of the device.

Action: Verify that the devices are correctly specified.

BCVM034E

I/O FAILURE ON DEVICE xxxx WHILE READING VOLSER, RC xx

Cause: A full RESTORE was requested and during the VOLSER identification process an I/O error occurred.

Action: Check that the device specified is correct.

Codes:

04 device not operational  
08 I/O error  
12 UCB failed validation

BCVM035R

PARTIAL RESTORE FROM BCV xxxx, REPLY Y TO RESTORE OR N TO FAIL

Cause: A partial RESTORE action has been requested.

Action: The operator must confirm the request.

BCVM999E

INTERNAL LOGIC ERROR

Cause: An internal error occurred.

Action: Contact EMC customer support.

## A.4 User Abend Codes

The following user abend codes are issued in the event a error occurs before the message system is initialized.

U0001

The SYSOUT DDNAME was not specified in the JCL.

U0002

The OPEN request failed for the SYSOUT DDNAME.

A

## Appendix B TECHNICAL SUPPORT

This appendix provides essential questions that the customer should be prepared to answer when contacting Customer Support.

B

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SMME MVS BATCH UTILITY MESSAGES

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## B.1 Troubleshooting Logistics

Please perform the relevant diagnostic steps before contacting the EMC Customer Support Center:

1. Read the documentation carefully.
  2. Reconstruct the events and describe them in writing.
  3. Run some simple test cases.
- If you encounter a problem that requires technical programming or analysis support, contact the EMC Customer Support Center at (1) (800) SVC-4EMC.
- Please do not ask for a specific support representative unless you are already working with that individual on your particular problem.

### Before Calling

Have the following information ready before calling your support representative:

1. ☐ Your company name.
2. ☐ Your name.
3. ☐ A phone number where you can be reached.
4. ☐ For an existing problem, have the problem tracking system ID, if one was previously assigned to the problem by a support representative.

### New Problems

For new problems, be prepared to provide:

1. ☐ The release level of SMMF MVS Batch Utility that you are running.

2. ☐ The SMMF MVS Batch Utility installation parameters, if applicable.
3. ☐ The machine type on which you are running (IBM 3090, Amdahl, etc.).
4. ☐ The operating system and release on which you are running (e.g., MVS/ESA 4.3).
5. ☐ The function(s) of the SMMF MVS Batch Utility that you are running.
6. ☐ If this is a security-related problem, the security package type, release, options installed, and the authority level of the user.
7. ☐ Can you recreate the problem?
8. ☐ Has the problem occurred before?
9. ☐ Has the function ever worked correctly?
10. ☐ For how long?
11. ☐ Under what conditions?
12. ☐ List changes to your system between the time the SMMF MVS Batch Utility worked and didn't work.
13. ☐ Present the exact sequence of events that led to the error.
14. ☐ The message numbers and complete text of any SMMF MVS Batch Utility messages that were issued.
15. ☐ The message numbers and complete text of any system messages that were issued (e.g., from the JES2 log).

16. ☐ The console log from around the time of the error, if it contains messages that do not appear on the JES2 log. For instance, I/O errors or bad datasets may result in IEA000I messages.
17. ☐ If there is a dump, the ABEND code and module name and offset.
18. ☐ Results from tests that you have run.
19. ☐ Any other related output.
20. ☐ Any other information that may help solve the problem.

Incomplete information may delay or prevent solutions to problems. If support representatives request more information and do not receive a response within four weeks, they will consider the problem closed.

If it is not possible to provide the information within four weeks, let the representative know so we can keep the problem open.

## Confirm a Fix

45-

When you receive a fix to a problem, please confirm the results of the fix to the support representative, whether or not it works. If they do not receive a response within two weeks, they will consider the problem closed.

## Document the Problem

If the EMC Customer Support Center representatives request information regarding a problem, please document the problem completely before sending it, including:

1. ☐ Your organization name and address.

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TECHNICAL SUPPORT

Troubleshooting Logistics

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## Appendix C EXAMPLES

This appendix contains two examples of business continuance processes.

- Example 1..... 78
- Example 2..... 79



## C.1 Example 1

This example suspends a backup device, backs up a dataset, and re-establishes the backup device.

```
//EMCBKUP JOB (EMC), CLASS=A, MSGCLASS=X
//*
//*****
//** SPLIT THE DEVICE'S *
//*****
//*
//SUSPEND EXEC PGM=EMCSMF
//SYSOUT DD SYSOUT=A
//SYSIN DD *
QUERY 1,100
SPLIT 2,140
QUERY 3,100
//*
//*****
//** RUN THE BACKUP *
//*****
//*
//BACKUP EXEC PGM=ADRDSSU
//SYSPRINT DD SYSOUT=X
//SYSOUT DD SYSOUT=X
//TAPE DD DSN=TAPE.DATASET.NAME, LABEL=(1,SL),
// DISP=(,CATLG),UNIT=3480
//SYSIN DD *
DUMP OUTDD(TAPE)
DS(INCLUDE(dsnames.on.dev140))
//*
//*****
//** SYNCHRONIZE THE DEVICE'S *
//*****
//*
//REEST EXEC PGM=EMCSMF
//SYSOUT DD SYSOUT=A
//SYSIN DD *
QUERY 1,100
RE-ESTABLISH 2,140,NOWAIT
QUERY 3,100
```

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EXAMPLES

## C.2 Example 2

This example establishes multiple BCVs, allows them to synchronize, splits them in preparation for backups, calls a userexit that will ask for a operator reply when the backups are complete, and resumes operation with the devices.

```
//EMCBKUP JOB (EMC), CLASS=A, MSGCLASS=X
//*
//*****
//** PERFORM THE REQUESTED ACTIONS *
//*****
//*
//PROCAT EXEC PGM=EMCSMF
//SYSOUT DD SYSOUT=A
//SYSIN DD *
GLOBAL WAIT,MAXRC=4
QUERY 1,100
ESTABLISH 2,140,100
ESTABLISH 2,141,101
ESTABLISH 2,142,102
ESTABLISH 2,143,103
QUERY 3,100
SPLIT 4,140
SPLIT 4,141
SPLIT 4,142
SPLIT 4,143
QUERY 5,100
USEREXIT 6,WAITKUP
RE-ESTABLISH 7,140
RE-ESTABLISH 7,141
RE-ESTABLISH 7,142
RE-ESTABLISH 7,143
QUERY 8,100
//*
```

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Example 2

# Glossary

This glossary contains terms related to disk storage subsystems. Many of these terms are used in this manual.

## A

### Adapter

Card that provides the physical interface between the director and disk devices (SCSI adapter), director and parallel channels (Bus & Tag adapter), director and serial channels (Serial adapter).

## B

### BCV Device

A standard Symmetrix device with special attributes that allow it to independently support applications and processes. See *Standard Device*.

### BCV Mirror

A standard device mirror (one of M2, M3, or M4) that is assigned to the BCV device upon establishing or re-establishing a BCV pair. See *Establish*, *Re-establish*, *BCV Pair*.

### BCV Pair

Consists of a standard device and a BCV device attached together.

### Business Continuation (BC) Processes

Processes that allow customers to access and manage instant copies of Symmetrix standard devices. See *Establish*, *Incremental Restore*, *Re-establish*, *Restore*, *Split*.

### Business Continuation Volume (BCV)

See *BCV Device*.

## C

### Cache

Random access electronic storage used to retain frequently used data from disk for faster access by the channel.

### Cache Slot

Unit of cache equivalent to one track.

### Channel Director

The component in the Symmetrix subsystem that interfaces between the host channels and data storage. It transfers data between the channel and cache.

## D

### Data Availability

Access to any and all user data by the application.

### Delayed Fast Write

No existence of room in cache for the data presented by the write operation.

### Destage

The asynchronous write of new or updated data from cache to disk device.

### Device

A uniquely addressable part of the Symmetrix subsystem that consists of a set of access arms, the associated disk surfaces, and the electronic circuitry required to locate, read, and write data.

### Device Address

The hexadecimal value that uniquely defines a physical I/O device on a SCSI channel path. A SCSI address consists of a Target ID and a Logical Unit Number (LUN).

### Device Number

The value that logically identifies a disk device in a string.

### Diagnostics

System level tests or firmware designed to inspect, detect, and correct failing components. These tests are comprehensive and self-invoking.

### Direct Access Storage Device (DASD)

Most commonly known as a magnetic disk device.

### Director

The component in the Symmetrix subsystem that allows Symmetrix to transfer data between the host channels and disk devices. See also *Channel Director* and *Disk Director*.

### Disk Director

The component in the Symmetrix subsystem that interfaces between cache and the disk devices.

### Dual-Initiator

A Symmetrix feature that automatically creates a backup data path to the disk devices serviced directly by a disk director, if that disk director or the disk management hardware for those devices fails.

### Dynamic Sparring

A Symmetrix feature that automatically transfers data from a failing disk device to an available spare disk device without affecting data availability. This feature supports all non-mirrored devices in the Symmetrix subsystem.

## E

### Establish

A BC process which assigns a BCV device as the next available mirror of a standard device.

## F

### Fast Write

In Symmetrix, a write operation at cache speed that does not require immediate transfer of data to disk. The data is written directly to cache and is available for later destaging.

### Field Replaceable Unit (FRU)

A component that is replaced or added by service personnel as a single entity.

## G

### Gigabyte (GB)

10<sup>9</sup> bytes.

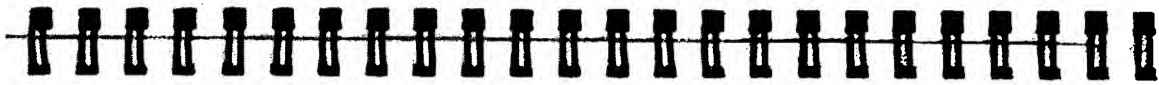




<b>H</b>	<b>Head and Disk Assembly (HDA)</b>	A field replaceable unit in the Symmetrix subsystem containing the disk and actuator.
	<b>Hyper-Volume Extension</b>	The ability to define more than one logical volume on a single physical disk device making use of its full formatted capacity. These logical volumes are user-selectable in size. The minimum volume size is one cylinder and the maximum size depends on the disk device capacity and the emulation mode selected.
	<b>Identifier (ID)</b>	A sequence of bits or characters that identifies a program, device, controller, or system.
	<b>IML</b>	Initial microcode program loading.
	<b>Incremental Restore</b>	A BC process which reassigns a BCV device as the next available mirror of the standard device with which it was previously paired. The other standard device mirrors are updated with the data that was written to the BCV device during the time of the BCV pair split. The data that was written to the standard device during the split is overwritten with data from the BCV mirror.
	<b>Index Marker</b>	Indicates the physical beginning and end of a track.
	<b>Index Point</b>	The reference point on a disk surface that determines the start of a track.
	<b>INLINES</b>	An EMC-provided host-based Cache Reporter utility for viewing short and long term cache statistics at the system console.
	<b>I/O Device</b>	An addressable input/output unit, such as a disk device.

<b>K</b>	<b>Kilobyte (K)</b>	1024 bytes.
	<b>Least Recently Used Algorithm (LRU)</b>	The algorithm used to identify and make cache space available by removing the least recently used data.
	<b>Logical Volume</b>	A user-addressable unit of storage. In the Symmetrix subsystem, the user can define multiple logical volumes on a single physical disk device.
	<b>Long Miss</b>	Requested data is not in cache and is not in the process of being fetched.
	<b>M</b>	
	<b>Media</b>	The disk surface on which data is stored.
	<b>Megabyte (MB)</b>	10 <sup>6</sup> bytes.
	<b>MII</b>	Machine Initiated Interrupt.
	<b>Mirroring</b>	The Symmetrix maintains identical copies of a designated volume on separate disks. Each volume automatically updates during a write operation. If one disk device fails, Symmetrix automatically uses the other disk device(s).
	<b>Mirrored Pair</b>	A logical volume comprised of two or more physical devices with all data recorded on each device.
	<b>P</b>	
	<b>Promotion</b>	The process of moving data from a track on the disk device to cache. See also <i>Stage</i> .
	<b>Q</b>	
	<b>Query</b>	A command that reports the state of all the BCV devices in the system.





**R**  
**RAID** Redundant Array of Independent Disks  
**Read Hit** Data requested by the read operation is in cache.  
**Read Miss** Data requested by the read operation is not in cache.  
**Re-establish** A BC process which reassigns a BCV device as the next available mirror of the standard device with which it was previously paired. The BCV mirror is updated with the data that was written to the standard device during the period that the BCV pair was split. The data that was written to the BCV device during the split is overwritten by data from the standard device.

**Restore** A BC process which reassigns a BCV device as the next available mirror of the standard device with which it was previously paired. The other standard device mirrors receive a full data copy from the BCV mirror.

**S**  
**Scrubbing** The background process of reading, checking the error correction bits, and writing corrected data back to the source.

**SCSI Adapter** Card in the Symmetrix subsystem that provides the physical interface between the disk director and the disk devices.

**Short Miss** Requested data is not in cache, but is in the process of being fetched.

**Split** A BC process which removes the BCV mirror from the existing BCV pair and assigns the BCV mirror back to its original device address. The BCV device then holds an instant copy of the data from the standard device.

Glossary

**Stage** The process of writing data from a disk device to cache.  
**Standard Device** A Symmetrix device.  
**SRDF** Symmetrix Remote Data Facility. SRDF consists of the microcode and hardware required to support Symmetrix remote mirroring.  
**Stage** The process of writing data from a disk device to cache. See also *Promotion, Destage*.  
**Storage Control** The component in the Symmetrix subsystem that connects Symmetrix to the host channels. It performs channel commands and communicates with the disk adapters and cache.

**String** A series of connected disk devices sharing the same disk director.

**Symmetrix Multi-Mirror Facility (SMMF)** A business continuance solution which allows customers to use special devices that contain instant copies of Symmetrix devices while the principal devices are on-line for regular Symmetrix operation.

**V**  
**Validate** Action that makes all tracks for a source volume valid on a target volume.

**Verify** A command that verifies that a BCV synchronization process has been successfully completed.

**Volume** A general term referring to a storage device. In the Symmetrix subsystem, a volume corresponds to single disk device.

**W**  
**Write Hit** Existence of room in cache for the data presented by the write operation.

Glossary

**Write Miss**

No existence of room in cache for the data presented by the write operation.

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